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Contents

Front Cover: Sheep on pasture of Leon Lewis, Barton County, Ga. Photographer unknown

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WELLINGTON BRINK
EDITOR

Keeping tractors Fit to Fight

By L. E. LOVE

A disabled tank does not win battles, and a tractor laid up for repairs is not helping to produce food for victory. On the battlefield mechanics work feverishly night and day getting tanks and airplanes back into action. Certainly we on the home front should do our part by using every precaution to keep our equipment in excellent condition.

Although our equipment is old, the Service and the soil conservation districts have spent ample money for maintenance, and the machinery should be in good condition. The fact that a number of units are idle or in poor condition, however, seems to indicate that a part of this equipment has been abused or neglected. It also points to the need for reviewing the basic principles to be observed in caring for heavy machinery.

A new tractor, if properly operated, lubricated, and adjusted, will run from 4,000 to 5,000 hours before major repairs are needed, and after an overhaul will give 2,500 to 3,500 hours of efficient service before another major repair is required. The average tractor, properly maintained, should give at least 10,000 hours of service before it is traded or retired from use, and I know of a number of tractors that have operated from 25,000 to 50,000 hours and are still giving efficient and economical service.

If, however, the new tractor is not properly operated, lubricated, and adjusted, it will probably need an overhaul after 800 to 1,000 hours, possibly even sooner. It matters not whether the tractor was put in the repair shop through neglect, ignorance, or willful misuse—the effect is the same. It is a crippled machine hampering the war effort.

"Water and the Land" will be discussed in next month's issue of *Soil Conservation* by the Hon. Marvin Jones, War Food Administrator, who has kindly permitted the reprinting of the brilliant address he made on a national radio hook-up the night of March 10.

EDITOR'S NOTE.—The author is head of the construction section, regional engineering division, Soil Conservation Service, Albuquerque, N. Mex.

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I believe that the Service could get maximum use from its tractors and keep maintenance costs at a minimum by the application of four simple rules:

1. Clean and refill the oil bath air cleaner daily.
2. Keep tracks in proper adjustment—neither too tight nor too loose.
3. Use clean fuel.
4. Keep the machine properly lubricated (including oil changes).
5. Practice "preventive maintenance." Prevent costly repairs and prolonged shutdowns by proper care.

Everyone recognizes the necessity of washing the oil bath air cleaner and refilling it to the proper level with clean oil once each day, but this important operation nevertheless is sometimes neglected.

Tractors usually work in dust, an abrasive that will cause excessive wear in contact with wearing surfaces. In either gas or Diesel engines, air is drawn into the combustion chamber. If this air is not filfered or washed before it gets to the chamber, dust will reach the piston rings, cylinder and piston walls, valves, and valve stems. Naturally, there will be scoring of these parts and very soon compression and explosion will force some of the abrasive past the piston into the lower chamber, where it will be mixed with the oil. The oil pump forces the oil and the abrasives to every bearing, gear, and moving part of the motor. Before long, a complete overhaul and replacement of parts will be needed.

It takes only a few minutes each day to wash out and refill the air cleaner. If it took 45 minutes, it would still be economy. Taking proper care of the oil filter is just as much a part of the operator's duties as driving the tractor, and he should be removed from the job if he neglects this duty.

Next, let's see how the operator may take proper care of the tractor tracks. Track assemblies on crawler-type tractors take the hardest beating of any part of the machine. They are in dust, dirt, mud, gravel or water all the time. With the exception of sharp sand under water, these physical conditions can be successfully dealt with if we take intelligent care of the track assemblies.

We need to keep two things uppermost in our minds: lubrication and adjustment. Keeping mud and dirt cleaned off the track assembly will pay dividends too, but lubrication and adjustment are more important.

A track is properly adjusted on a 50- to 60-horsepower machine when you can lift the track 2 inches above the track carrier roller. A tighter adjustment causes the track to bind at its 35 pins and bushing. If this tension were maintained, it would wear out the pins and bushings, as well as the front idlers, drive sprockets, and bearings in a comparatively short time.

Land leveling near Las Animas, Colo.

The more common practice, however, is to run the tracks too loose. A loose track will not stay in alinement. It tends to ride the flanges on the idlers and track rollers, will crawl to the top of the teeth on the drive sprocket, and, when traveling at high speeds, will bounce and whip against the track rollers, often breaking roller flanges and track pin bushings. Eventually, the flanges will be in such bad shape that the tracks will run off the idlers when the tractor is making a turn.

Crawler-type tractors should be driven on a road or highway no more than is absolutely necessary, and then only with the tracks properly adjusted. It costs $352 to buy two new track chains and, in addition, considerable labor is required to change the shoes from the old to the new chains or rails.

Besides keeping the air filter clean and the tracks properly adjusted, the operator should be careful to use clean fuel. Dirty fuel causes fouling, missing, uneven combustion, and loss of power. It will also cause excessive wear of fuel pump parts and plug the sprayer injection nozzles.

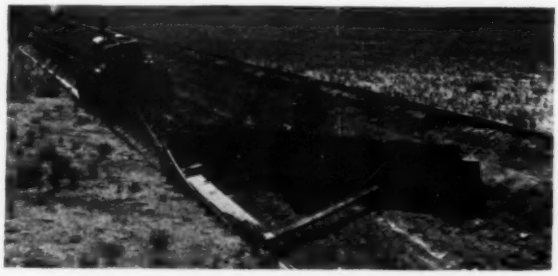
The commonest cause of dirty fuel is that the barrel in which the fuel is carried may have rust, sediment, scale, water, or other foreign matter in it. When a barrel of fuel is brought to the job in a pick-up or truck, the sediment is stirred up and suspended throughout the barrel. For that reason, the truck should be parked for at least 4 hours after reaching the job so that the foreign matter will settle. Then the pump or suction hose should be cleaned of any dust or dirt and inserted in the barrel so that the end is 2 inches from the bottom of the barrel. In this way, sediment will not be drawn into the tractor tank. All fuel filters, traps, and strainers must be cleaned and serviced regularly.

The easiest, cheapest, and most efficient way to keep tractors in good running order is to practice *preventive maintenance.* This means that the operator must have the training and willingness to treat machinery with respect.

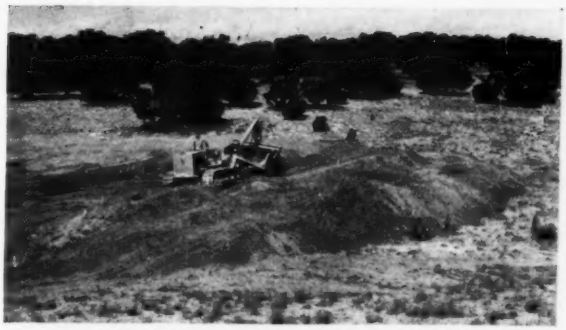
When the well-trained operator comes to work in the morning, he opens the drain cock under the fuel tank and drains off any sediment, water, or foreign matter that may have settled to the bottom of the tank during the night. Then he checks the radiator and crankcase, to see whether he needs to add water or oil.

If the tractor has a Diesel engine, he starts the small gasoline starting engine and lets it run at normal speed. While this motor is running and warming up the Diesel engine, he takes his volume compressor and grease gun and, starting at the front of the tractor, greases every point on one side of the machine until he gets to the drawbar.

By this time, the Diesel motor should be warm. He throws the starting clutch in and starts the Diesel motor turning over. After it has turned 25 to 50 revolutions, he shifts the injection pump control lever from the "stop" to the "run" position. The Diesel motor should then start, and the operator cuts off the starting engine and lets the Diesel engine idle while he lubricates the other half of his tractor. By the time he has finished, the Diesel engine will be warmed up, the oil circulating, the temperatures equalized in the various parts of the motor, and his entire machine lubricated for the day's run. He puts his grease guns in a safe place where they will not be damaged or covered with dirt and starts his day's operations.



Terrace construction, Union County, N. Mex.



Scooping out a stock tank, Claunch-Pinto Soil Conservation District, N. Mex.

During the day's work, the operator stops and makes any necessary adjustments, such as the tightening of nuts and bolts. In other words, if he notices something working loose, he makes the adjustment at once. If he should wait until the noon hour or the end of the day, serious damage may be caused and replacement of the part may be necessary. It is a "must" that sufficient tools be with each piece of equipment at all times.

This type of operation is preventive maintenance. It's the old principle of an ounce of prevention being worth a pound of cure. We speak of tractor repairs and shut-downs as equipment problems. Usually, they are *human* problems. The life of a tractor or of any other piece of heavy equipment depends primarily on the way human beings operate and maintain that equipment.

I repeat that a broken-down tractor is a victory for the Axis. Let's handle our machinery with intelligence and care and thereby hasten the day when peace will come again.

DRAINAGE DOUBLES YIELDS ON MARYLAND'S EASTERN SHORE

By R. E. UHLAND

A survey of 67 farms on the Eastern Shore of Maryland shows that drainage work pays big dividends in increased food production. The average corn yield on 17 farms in Caroline County increased from 19.6 bushels per acre to 42.9 bushels after draining. On 23 farms in Queen Annes County the increase was from 11 bushels to 38.9 bushels, and on 24 farms in Somerset County the corn yield was raised from 30 bushels to 50.4 bushels.

Wheat, hay, fruit, and vegetable crops were similarly improved. The average wheat yield of all farms included in the survey more than doubled, being raised from 11.2 bushels per acre to 22.7 bushels per acre. The hay yield of 64 farms jumped 0.84 ton per acre to 2.25 tons after drainage. The yields on three additional farms in Kent County, where 315 acres needed drainage, were similarly improved. Corn increased from 24.3 bushels to 46.1 bushels,

EDITOR'S NOTE.—The author is research-operations liaison officer, Soil Conservation Service, Washington, D. C. Good background reading for this article is provided by Ray W. Carpenter's "Districts Invoke Drainage to Increase Crop-Growing Area," which appeared in the June 1943 issue of this magazine.

Lack of drainage limits crop production on this type of land. Not more than one crop in 3 years can be counted on.

Draglines were used extensively for improving the drainage in eastern Maryland.

wheat from 14.3 to 24.9, and hay from 0.87 ton to 1.51 tons.

Plans for the survey were developed after a general field inspection of several drainage projects by representatives of the Soil Conservation Service and the Maryland Agricultural Experiment Station. They provided for personal interviews by field technicians in the course of their regular work.

The description of the land in these farms with respect to use and yields, before and after drainage, are shown in the accompanying table. There were 10,879 acres in the farms surveyed, of which 6,692 acres or 61.5 percent needed drainage. Much of this land had been drained earlier but many of the ditches, especially the major outlets, had become clogged. As a result 1,845 acres or 39.0 percent of the cultivated land failed to produce a crop almost every other year. The improved drainage consisted mainly of large community and tributary ditches. These open ditches were supplemented on eight farms by a few lines of tile.

Douglas Rochester of Barclay, in Queen Annes County, had this to say concerning drainage: "Half of my tillable land was uncertain of crop production because of poor drainage. Only in fairly dry years did I realize anything from this land, but since the Oxdale ditch was dug by the CCC camp, I have not had a crop failure due to poor drainage and my yield per acre has increased. This ditch is a wonderful benefit to my farm."

Howard J. Stant, of Price, reported an average yield of 55 bushels of corn and 25 bushels of wheat per acre after the opening up of the Sugar Loaf tax ditch in 1936. Prior to this his acreage yields were 25 bushels of corn and 15 bushels of wheat. He declared that he could not adequately express what drainage has done for him. "When I bought this farm of 215 acres in 1932," he said, "it was grown up in briars and bushes. The first year I was on this farm I agreed that it was just about what the neighbors called it—"a frog pond." I thoroughly ditched the farm, but did not have sufficient outlet for the water until the CCC camp opened up the Sugar Loaf ditch in 1936 and the soil conservation district opened up the Kimbles branch in 1942. I now have a farm that will produce as well as any farm in this section."

This testimony is indicative of what farmers in eastern Maryland have experienced with drainage. They have found that it is much simpler and far more dependable to improve the drainage of their land than it is to depend solely on favorable seasons. With improved drainage supported by proper cropping and cultural procedures, these farmers have learned to expect a good crop every year instead of only about once in 3 years on much of their land.

The Agricultural Census shows that in 1939 there were 133,469 acres in drainage districts in Caroline, Queen Annes, and Somerset Counties. Surveys show that there is still a large acreage in these three counties that needs drainage. Part of this is inside and

What improved drainage added to the production of each drained acre cropped to corn, wheat, or hay.

part outside of the drainage districts. While it is recognized that not all of the land is in need of drainage to the same extent as the farms in this survey, the findings show that adequate drainage more than pays for itself through increased production.

Field technicians of the Soil Conservation Service work with the soil conservation districts in Maryland. They study the land in the districts in much detail. They determine, in cooperation with the farmers,

(Continued on page 231)

Effects of Improved Drainage on Crop Production [1]

[Survey of 64 Farms on Eastern Shore of Maryland]

	Caroline Soil Conservation District	Queen Annes Soil Conservation District	Somerset County	Total for 3 counties
Number of farms included	17	23	24	64
Total acres in farms surveyed	2, 967	4, 660	3, 252	10, 879
Acreage affected by drainage	956	2, 681	3, 055	6, 692
TOTAL ACREAGE NEEDING DRAINAGE				
Cultivated land:				
Before drainage	801	2, 129	1, 738	4, 668
After drainage	143	35	223	401
Idle land:				
Before drainage	42	8	0	50
After drainage	0	0	0	0
Pasture and woodland:				
Before drainage	113	544	1, 317	1, 974
After drainage	0	30	303	333
TOTAL ACRES FAILING TO PRODUCE A CROP BECAUSE OF POOR DRAINAGE				
Before drainage	554	1, 002	389	1, 945
After drainage	42	25	13	80
ACRE YIELD OF CORN, WHEAT, AND HAY FOR ARTIFICIALLY DRAINED LAND				
Corn:	*Bushels*	*Bushels*	*Bushels*	*Bushels, average*
Before drainage	19. 6	11. 0	30. 0	19. 5
After drainage	42. 9	38. 9	50. 4	43. 7
Wheat:				
Before drainage	10. 9	8. 3	15. 0	11. 2
After drainage	23. 0	20. 8	25. 0	22. 7
Hay:	*Tons*	*Tons*	*Tons*	*Tons, average*
Before drainage	0. 54	0. 42	1. 5	0. 84
After drainage	1. 80	1. 56	3. 2	2. 20

[1] Data were secured by James R. Carroll and William J. Frere, Jr.; for Queen Annes Soil Conservation District, O. E. Kelley for Caroline Soil Conservation District, Paul T. Ward for Somerset County and Ralph W. Ruble for Kent Soil Conservation District. All of these men are Soil Conservation Service field technicians who are working with the soil conservation districts.

Drainage has made this field highly productive. Before drainage it could not be depended on to produce more than one crop in 3 or 4 years.

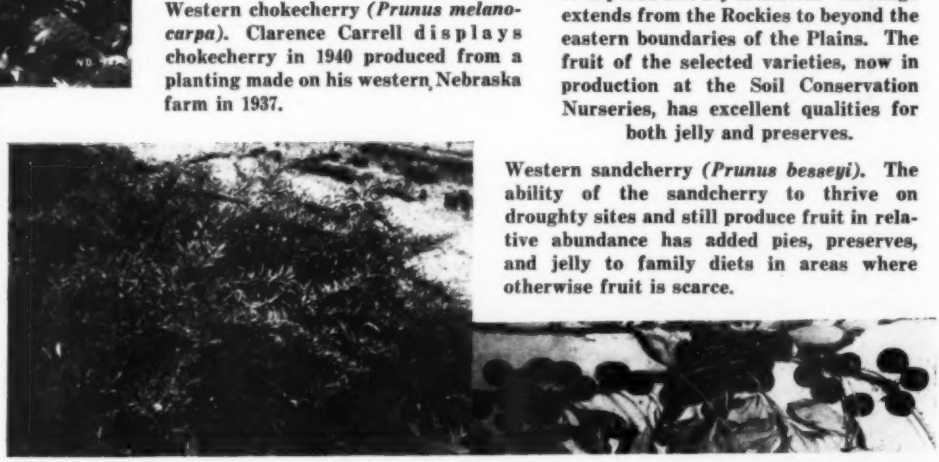
SAVE SOILS AND PASS THE JELLY

At left—above—is seen a field windbreak on Achille Lebbrecht's farm west of Fargo, N. Dak. At right we find Mr. Lebbrecht just 2 years later proudly displaying the fruit of his labor—wild grapes produced in the fence row. Other fruits to be found in this planting are chokecherry, plum, and sandcherry.

American plum (*Prunus americana*). The most widely distributed and used of all the wild fruiting shrubs native to the Northern Great Plains. It is about the most dependable fruit producer in the area and readily fits into almost every type of woody planting for soil and moisture conservation.

Western chokecherry (*Prunus melanocarpa*). Clarence Carrell displays chokecherry in 1940 produced from a planting made on his western Nebraska farm in 1937.

Golden currant (*Ribes odoratum*). The golden currant is particularly adapted to exposed and dry locations. Its range extends from the Rockies to beyond the eastern boundaries of the Plains. The fruit of the selected varieties, now in production at the Soil Conservation Nurseries, has excellent qualities for both jelly and preserves.



Western sandcherry (*Prunus besseyi*). The ability of the sandcherry to thrive on droughty sites and still produce fruit in relative abundance has added pies, preserves, and jelly to family diets in areas where otherwise fruit is scarce.

By M. S. McMURTREY and A. D. STOESZ

Fruit-producing shrubs planted in field borders, shelterbelts and farmstead windbreaks in the Northern Great Plains which long ago proved their worth in protecting fields and homes from winds, are now paying other and equally important dividends. An estimated half-million glasses of jelly, jam, and preserves go yearly into fruit cellars throughout the region.

This food resource is growing. The need for increased food production, and the scarcity and high cost of fruit on the market, have stimulated the growing of native fruits. And the possibilities for planting fruit-producing shrubs on small, odd, and irregular areas of farmland are being given greater consideration. Gullies, blow-outs, rocky knolls, rock outcrops, fence rows, field corners, irrigation canal banks and woodland borders—once commonly classed as areas of no agricultural value—are proving to be excellent for wildlife and for the establishment of fruit-producing plants.

Varieties native to the region hold first place. Shrubs in greatest demand by soil conservation districts in 1943—adding up to more than half of the 4¼ million woody plants consigned to districts—are American plum, chokecherry, western sandcherry, golden currant, and buffalo berry. Their popularity over other fruit-producing species lies in their hardiness. They thrive in a variety of sites and temperature ranges, and have the ability to do well in areas of low and erratic rainfall.

Although the Northern Great Plains is not usually considered a fruit-producing area, it is now evident that there is no reason why most of its families cannot have fruit for jellies and other table use by acting on the experience of other farmers and on the findings of experiment stations.

Western sandcherry is one of the good performers. A native of the Plains, its range extends from Kansas to Hudson Bay and westward to the foothills of the Rocky Mountains. Its preference is for sandy soils. It also does well under cultivation on the heavier soils, and has been established successfully on all sites in the Plains where trees and other shrubs thrive.

Early settlers picked western sandcherry in the wild and found it only slightly inferior to some fruits obtained from shrubs they brought overland. It was found to excell in winter hardiness, drought resistance, and tolerance of heat, but its fruit was relatively low in quality. State and Federal experiment station horticulturists recognized this as early as 1900 and since then have made selections for improved quality and larger-sized fruit.

In 1937, the Soil Conservation Service obtained enough plants of the thirteenth generation of improved strains to establish a seed production block. Thus, from a relatively small start, the quantity of planting stock of this species has been increased—70,000 in 1939, 195,000 in 1943. Indications are that demands for this and other hardy fruit-producing shrubs are still on the increase.

When a brown rot epidemic destroyed fruit on about 90 percent of the shrubs in the seed production plot, nursery technicians made cuttings from the 10 percent that escaped the disease. By selection and propagation the Service soon will have made still further improved planting stock available in the Plains region.

Nursery technicians are also giving attention to improving the quality of the fruit. The yellow and red fruit is less astringent than the more common purple-black. The goal is to produce a plant which is disease resistant and which yields fruit of high quality.

Farmers cooperating with soil conservation districts also give sandcherry a high rating. John Dillon, district conservationist in the Red River Valley in North Dakota, reports its popularity:

"Of the younger shrubs, sandcherries are the quickest producers of fruits for preserves, sauce, and syrup. The community of Pisek picked about 40 bushels of sandcherries at the Fred Seidl farm. These were planted in 1940. Many sandcherries also were picked on the Farrup ranch in the buffer strips in contoured fields. John Sven of Edinburg says the sandcherries from his 1941 planting made wonderful jams and jellies, also a syrup spread for hot cakes."

Out in Montana, Henry Hoye of Froid is another farmer who has had profitable experience with sandcherries.

Many families have traded plums and chokecherries to their local stores for groceries or have made outright sales this past year, thus adding to their cash income. Says Mrs. Elmer Staven, wife of a soil conservation district cooperator in North Dakota, "I sold several bushels of plums from our shelterbelt. Many of the younger boys and many farm owners in this community made good money from shrub fruits picked in shelterbelts."

Their dual value is what makes native fruit-producing shrubs so important to the Northern Great Plains. Plantings to conserve soil and moisture and bring waste areas into production are also being utilized as a means of supplying large quantities of high-vitamin fruits to farm families.

EDITOR'S NOTE.—The authors are chief, regional biology division, and chief, regional nursery division, respectively, Soil Conservation Service, Lincoln, Nebr.

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A FARMER TALKS ON PERMANENT COVER CROPS

L. W. Veerkamp is one of more than a score of farmers in the Central El Dorado Soil Conservation District who turn permanent cover crops in their orchards to double account by running sheep in them.

By ROY M. MARKS

I could talk at length about the beauty and value of our sheep, and about the virtues of the permanent cover crop in our 15-acre pear orchard that helps to feed our farm flock.

The sheep paid the irrigation bills during the tough years, and now in wartime are proving profitable producers of lambs and wool. The orchard cover and other soil-conserving grass crops enable us to deliver good stuff economically to the markets from our 178-acre place 3 miles southwest of Placerville, Calif. This place was an old, run-down ranch when we moved to it in 1924. Goats, too, played an important part in the ranch development. We used them to clear sheep pasture and to pay for the fencing. We are using them, also, on the approximately 50 acres of second-growth oak land yet to clear.

EDITOR'S NOTE.—The author is president of the board of directors, Central El Dorado Soil Conservation District, Placerville, Calif.; also, member, El Dorado Irrigation District, chairman of the El Dorado County Farm Bureau, sheep department, and secretary of the Farm Bureau directors.

I was considered one of the laziest farmers in the country, because I insisted on using cover cropping and other practices so we would not have to plow in the orchard, for example, and so we could get more work done and produce more all over the ranch. When the Central El Dorado Soil Conservation District was organized by farmers in this area in 1940, though, I was mighty glad I had some experience to qualify me for the job they gave me on the board of directors.

In fact, I give these and our other time-savers, such as specially contrived stockpens and loading chutes, credit for giving me time to hold down this and other such jobs.

They ask me how I can serve so much time on boards. That is what makes it easier for me here at home—I generally learn something serving on those boards! Then, these things you see are all labor-saving. That is why we can run the ranch alone.

Cutting corners on labor is how Mrs. Marks and I were able to put 70 tons of hay through the chopper, except for $5 worth of labor, in 1942. It is how we managed to pick 4,268 boxes of pears by ourselves, saving $19.20 in hired labor. Our 14-year-old

son, Melvin, was then in the hospital with appendicitis and, of course, Irving is in the Navy. Mrs. Marks worked on the wagon hauling the hay, and I did the pitching.

Of all our "new wrinkles" in farming, as you might call them, grazing sheep on permanent orchard cover crops has attracted perhaps the widest attention. I guess I was one of the first to try that around here. More than a score of farmers in the Central El Dorado district alone now are using this practice. They include L. W. Veerkamp and George Volz of the soil conservation district directors. The other directors are Leo N. Ench and W. J. Clark.

I think cover crops are the main thing. A lot of these farms that I saw as a kid in this country were good farms. Then they went down until they weren't worth anything. There were hundreds of head of work horses. People raised too much grain for seed. Now, though, new fellows have taken over and are growing cover crops and building the ranches up into good places again. Through our district we've got a lot of fellows doing many things that they couldn't do by themselves before.

One such war feed and food production undertaking I have in mind is a full story within itself. That is the hammermill the district bought and rigged up to chop hay—urgently needed because our farmers are yearly increasing the numbers of livestock. District farmers jumped from 3,200 sheep in the local pool in 1941 to 7,000 in 1943.

We aim to keep around 100 ewes. With a 95 or 96 percent lamb crop in 1943, we had approximately 230 head of sheep. I swear by these little farm flocks close to the house, where there is no reason why they cannot be given good care.

Roy Marks, writer of this article, admires three of his purebred Corriedale rams in a pasture near his ranch house, 3 miles southwest of Placerville, Calif. On the other side of the fence may be seen the edge of a small irrigation pond that abounds with edible bullfrogs.

One of the main advantages of running sheep in the orchard is that they utilize a lot of feed that brings in a profit. My place is clean, along the fence lines, in the corners and around the buildings. My fire hazard is reduced to a minimum.

Our orchard cover consists of native grass, redtop clover seeded some years ago, and some Alsike. We like to plant a little Ladino, too. We turn in the sheep after the fruit has been picked, in September. They are left in usually not more than 2 or 3 hours in the evening, being taken out before they start wandering and attacking the trees. In the spring, the sheep are again pastured in the orchard until shearing time, because I like to have the ewes bed down with full stomachs every night. Always used dry feed to supplement the pasture feed.

We also believe it is important to have a number of fields and move the sheep around, to keep them from getting tired of one field and destroying feed, and to give the grass a chance to freshen up. We likewise try to have feed left over, instead of running short and having to buy.

We are especially proud of the "no plowing" technique made possible by the orchard cover crop and other grass-type crops. On the ranch I operated before taking over this one, we grew permanent cover for years, and never plowed.

We reason that not to plow cuts down the expense of operating—why plow it and wash all the good land down to the flats? Ditches had cut 2 feet deep, and you could hear the heads of water in them.

Ladino clover is a greate favorite. In summer, we keep the lambs on a 3-acre field irrigated by a sprinkler system installed under the water facilities programs. That Ladino piece has helped us to almost double our flock. We have worked out this conservation farming set-up under the same kind of a 5-year program we have used successfully for other parts of the ranch ever since we came here to live. This program provided for a considerable additional acreage of pasture for raising and grinding approximately 50 tons of oats and vetch hay each year, for terracing a 12-acre field which District Conservationist H. M. Lumsden tells me was the first job of its kind in the county, and for using yellow pine poles obtained in thinning from our good neighbor's woodland for barn rafters and studs and other farm building purposes.

We even have frog legs on the table when we want them, from the big croakers thriving in the

(Continued on page 231)

GOLDBERGIAN GADGET MAY BOOST VALLEY'S OUTPUT


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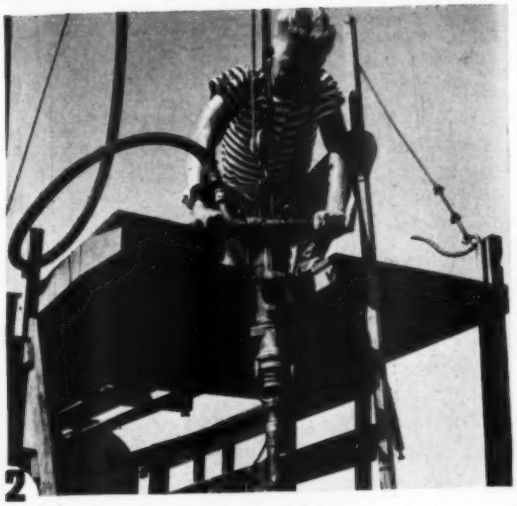
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EDITOR'S NOTE.—*Some months ago Writer Frank B. Harper of the Pacific Coast Region made it a point to journey south from Portland all the way down to El Centro in southeastern California. He wanted to look into what was being done to find the answers to drainage and allied problems affecting vital war food production in the Imperial Valley—the famed setting for "The Winning of Barbara Worth." Mr. Harper traveled among the Valley's fields of flax, alfalfa, winter vegetables, and rice stubble. He walked through grapefruit orchards and date palm groves. He skirted fine pastures where "Mexican" and Brahman cattle grazed, as well as cattle of the standard breeds.*

Mr. Harper took copious notes. He recorded the fact that there had been less than 1 inch of rainfall in the full year preceding with the annual average being around 3 inches. He noted that the highest annual precipitation ever reached was around 10 inches. The 30-mile-wide, fertile desert valley extends approximately 45 miles north from the Mexico border at Mexicali and Calexico to the Salton Sea. It depends upon 1,700 miles of irrigation canals to provide water, which is brought in from the Colorado River many miles away, and relies upon another 1,200 miles of drainage ditches to carry away the surplus.

Roughly, 475,000 acres of the Valley's lands are considered farmable. Approximately 412,000 acres are actually cultivated, the discrepancy between the two figures being largely because of poor drainage and resulting alkali conditions. Some of this land has been pickled since the days before the white man's advent. More important, drainage troubles are keeping many thousands of acres from producing at maximum capacity and must be solved before any major improvements may be expected.

Mr. Harper listened and scribbled literally for hours while District Conservationist William W. Fox and Assistants Vladimir Aronovici and William W. Donnan of the Division of Irrigation explained their techniques and apparatus, including the new and efficient truck-mounted soil-coring machine developed by Willis C. Barrett, now doing hydraulic engineering work in China on assignment to the State Department's Division of Cultural Relations.

At about this point, he met E. A. Fitzhugh, who is the editor of a leading California newspaper at El Centro. Editor Fitzhugh needed only a few of Photographer Robert Branstead's pictures, plus captions and some notes of his own, to scoop Writer Harper—much to the latter's delight. Following is Mr. Fitzhugh's intriguing account of how scientific research and ingenuity are rising to meet a practical need of the times.

By E. A. FITZHUGH

It looks like a Rube Goldberg arrangement of brass tubes, glass tubes, rubber hoses, tin cans and assorted gadgets, but if today's dream is the parent of tomorrow's reality, it may be the forerunner of the scientific age's greatest blessing for Imperial Valley farmers.

The Goldbergian gadget is the ambitiously named variable head multiple manometer discharging permeameter, but the chances are its future offspring—if those dreams are realized—will be called something simple, like drainage meter.

For at U. S. Soil Conservation Service quarters in El Centro, where Researcher V. Arnovici is the VHMMDP's guardian and Manager Bill Fox its awed sponsor, the machine is regarded as merely one step in a long series of investigations into the peculiarities of Imperial Valley soil when it comes into contact with water, or vice versa.

Even since it was set up, the VHMMDP has given birth to more widely roving offspring, for while the arrangement pictured with this article is a laboratory resident pure and simple, to which selected samples of earth are brought for testing, four smaller units have been constructed since its completion, and their function is to make the same tests under actual field conditions.

1. First step in search of solutions to Imperial Valley drainage problems is taking of soil cores with this new, truck-mounted apparatus developed by Willis C. Barrett. District Conservationist Fox and Engineer Donnan set up the A-frame preparatory to taking field samples.

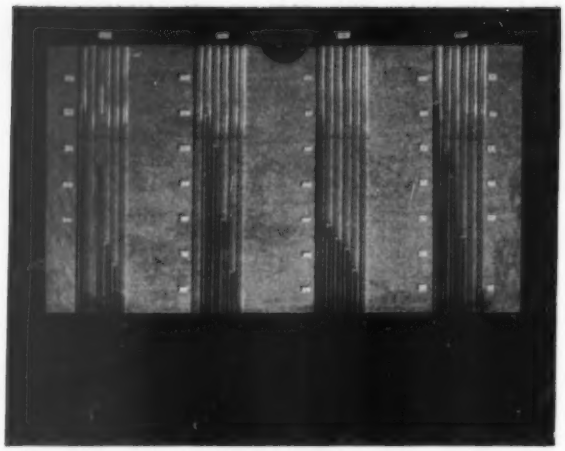
2. Donnan drives the soil tubes down with a jackhammer.

3. Fox signals that they are deep enough.

4. Donnan pulls up the tube with a Coffing hoist.

5. Fox removes the split inner-sleeve from the first 18-inch soil core increment on the corrugated-roofing logging-table marked in half-foot lengths, while Donnan cleans the coring cylinder.

6. Soil Technician Aronovici splits the samples with a knife to study their microstructure and the intricate stratification which have important bearing upon water behavior beneath the surface of the valley's croplands.



This manometer board measures the pressures at various points in samples of Imperial Valley soils. The samples are behind the board in the brass tubes described by the author of this article.

It is the hope of Fox, Aronovici, et al., at soil conservation offices, that some descendent of the VHMMDP, in the not too far distant future, may be capable of almost instantaneous operation. If that hope can be achieved—and the soil conservation workers stressed that it is nothing more than a hope now—the day may come when a farmer may come in with a core of soil from his farm, see it put into the machine, and within a few minutes be told what are the proper steps to take in providing drainage for the particular part of his farm from which the soil core came.

As nearly as a layman can understand the purposes of the present VHMMDP, it is to determine how fast water will run through a given bit of earth, and at what rate the seepage slows down during its progress. The knowledge has an extremely practical farming application, for it may mean the difference between successful and unsuccessful tile drainage, which in turn may mean the difference between extremely productive and entirely unproductive acres.

Facts Determined

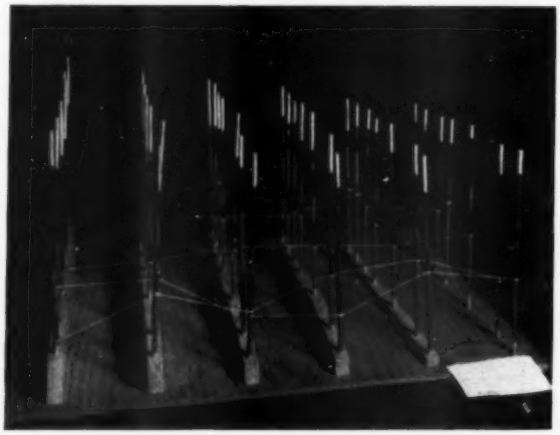
Through the laboratory's present machine, the soil Conservation Service has already determined a number of facts, including the one that minute stratification of mica flakes in some sandy valley soils causes water to flow faster horizontally than vertically through the soil.

Indicating the vast detail of work still to come if the valley is to be mapped according to drainage needs, Arnovici has discovered that in the more permeable of valley soils, the degree of permeability covers as wide a range as from 1,000 to 1, and a far wider range when the less open soils are included.

Simple Principle

The VHMMDP, sight of which is enough to confuse the uninitiated, operates upon a fairly simple principle. The skeleton idea of the machine might be likened to a water bucket with a pipe soldered to the bottom, running downward and attached to the bottom of an upright glass tube. If that were done, the water in the glass tube would rise to a height equal to that of the water in the bucket. If, however, the pipe were attached to the bottom of a brass tube, the tube filled with earth, and glass tubes attached to the brass casing at intervals, the water in each of the glass tubes would rise to a different level because of interference offered by the soil.

In other words, the permeability of the soil under different pressures would be measured. That is



This miniature forest of sticks represents underground conditions on a piece of land noted for its good drainage. Each small post stands for a soil core taken to 9-foot depth. The sticks are of different colors, each showing a distinctive type of soil. The strings tell the irregularities in the tops of the various soil strata. The white string nearest the 9-foot depth tops a layer of coarse soil material that makes this particular piece of land excellent for drainage—and war production—by permitting tile lines to work properly.

what VHMMDP does. But don't ask us how to read the results.

Ask Aronovici—or Fox.

After all, that's their job. It is a job they are doing for the Soil Conservation Service, in collaboration with the Imperial Irrigation District, the Farm Credit Administration and the University of California, all parties to the continuing drainage survey of Imperial Valley.

Tile drainage isn't the whole answer to Imperial Valley's No. 1 agricultural problem.

If one thing has been demonstrated more conclusively than another by the U. S. Soil Conservation Laboratory in El Centro in the continuing drainage survey of Imperial Valley, it is that tile drainage is tops—but only when it is done right, and only when the soil is right for tile.

Doing it right means mapping the underground, determining the various types of soil material in the piece of land to be drained, and laying the tile at the right depth, in the right strata to give maximum results.

Kingpin in the business of delving into the earth's secrets is the soil coring apparatus developed to probe to a depth of from 9 to 16½ feet and bring up samples of the soil layers for examination by soil conservation agents employed in the continuing drainage survey.

Once the soil cores are examined and classified, it is possible for the expert analysts to determine the underground make-up of the land, and even to "map" it. One such map is that pictured here.

Coring, technical developments for examining the make-up of various types of soil discovered at different levels, investigations to determine how readily water will seep through these types of soil—all these are phases of the drainage investigation which is working toward eventual solution of the problem of waterlogged land and less productive acres.

Tile, the investigations have already disclosed, can lose a great deal of its efficiency if wrongly placed, and can gain greatly in efficiency if laid to take advantage of possible coarser, more permeable layers of soil found in some parcels of valley land.

The valley's soil peculiarities, however, present a constant problem to the investigators, for the make-up of soil may vary greatly from one farm to another, or even on the same farm. With this fact in mind, and realizing that every drainage project may present a new problem, the principal aim of the Soil Conservation Service workers at this time is to develop equipment which, someday, may make quick tests possible on individual parcels of land so that each farmer may know the character of his soil—and the best drainage method to be employed there.

Long strides have been made already in the development of such equipment. The soil coring apparatus, mounted on a truck for field work; the laboratory gadgets for finding out how fast water flows through various types of soil; the soil "maps" prepared and studied by the researchers; test wells and sumps established throughout the valley—these are steps completed or nearing completion since the laboratory was established.

Still greater steps are anticipated when the pressure of wartime is removed, and normal research conditions again prevail.

(Continued from page 223)

the best methods to effect better drainage on the flat lands and to control erosion on the sloping lands. They recommend land use practices which have been found effective in producing higher yields than under existing practices.

Research findings show that for best returns soil conservation farming must be initiated before erosion progresses too far. The production of sloping land is markedly lowered because of the loss of fertile topsoil. The deposition of eroded subsoil may also lower the potential production of the bottom lands.

It is obviously important that both sloping and flat lands be conserved. There are at present 15 soil conservation districts in operation in Maryland. Three of these are included in this study. These districts have as their major objective the practical conservation of their soils.

Experience has shown that an expenditure of from $10 to $30 per acre on drainage will raise the production of ordinary farm crops enough to pay the cost with but one or two crops. Drainage has also made possible the growing of fruit and truck crops on much of this land. These more intensive crops give much higher cash returns than do regular field crops.

In view of the urgent need for more food to help win the war and to assist in supplying devasted countries during the rehabilitation period, it is important that all possible means of obtaining more food from good land be used without delay. The data presented show that drainage offers an excellent means of accomplishing this end in eastern Maryland. They add substantiation to observations in other States, where better drainage has been an important factor in quickly augmenting the food supply.

(Cantinued from page 227)

little irrigation pond below the house. Two weighed a pound and a quarter dressed out, and I've counted as many as 68 of the big ones on the bank in one day.

From our start 6 years ago with 25 blackfaces, we have been able to improve the quality of the flock as well as the size. We now have all Corriedale and Romeldale sheep, including 4 purebred yearling Corriedale rams I bought in the spring of 1943; with their 4- to 5-inch fleece still on.

A NEW LEGUME-GRASS PARTNERSHIP

Pasturing second-year Canada wild-rye and sweetclover combination in late May on the Herbert Halverson farm in Monona County, Iowa.

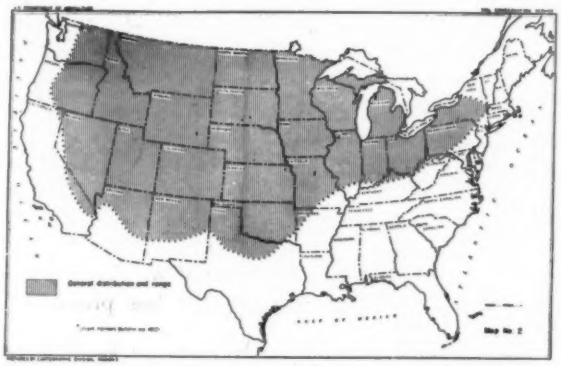
By MAURICE E. HEATH and MORTON C. JAMES

Canada wild-rye, which has only a fence-row background, appears to have a place in combination with sweetclover in short rotations on rolling land in western Iowa.

Preliminary on-the-farm results show that the sweetclover-Canada wild-rye combination forms a protective sod, practically eliminates bloat, and guards the land against soil washing between the time the sweetclover matures and the corn is planted the following spring.

Sweetclover, which grows very aggressively on the 6 million acres of Knox-Marshall soils in western Iowa, is used extensively for green manure, hay, and rotation pasture in short rotations. Its greatest weaknesses are its soil-loosening effect (on sloping land) and its bloat hazard when pastured. Prior to World War II, approximately half of the sweetclover in western Iowa was left over the second year and used as rotation pasture. It is with second-year sweetclover that Canada wild-rye can make its greatest contribution in the soil and moisture conservation program and as forage.

Twenty-nine field trials in western Iowa since 1939 have shown that Canada wild-rye, known botanically as *Elymus canadensis L.*, has consistently produced good stands in contrast with timothy and smooth bromegrass, which often failed. It is resistant to drought and heat, and grasshoppers, a perennial pest on western Iowa farms, like it less than smooth bromegrass. Canada wild-rye is large-seeded and easily established. In the trials it has been broadcast like the cereal crops. Good stands have been obtained even under drouthy conditions. Both drills and endgate seeders were used to plant the seed, which weighs approximately 26 pounds per bushel when processed. Satisfactory stands have been obtained with 20 pounds of Canada wild-rye per acre, the customary amount of sweetclover, and not more than 2 bushels of oats. This rate of seeding has produced between 5 and 9 Canada wild-rye plants per square foot in the seedling year.



General distribution and range of Canada wild-rye in the United States.

Observations have disclosed that when sweetclover is in its second year, Canada wild-rye starts growing 2 to 3 weeks earlier in the spring, but both crops mature early in August. Beef cattle have found that Canada wild-rye, when used in a mixture with sweetclover is palatable in its early leafy stages. Herbage of the two species is grazed about equally when pastured.

At the soil conservation nursery at Ames, yields of processed Canada wild-rye seed under clean-cultivated conditions averaged 500 pounds per acre.

EDITOR'S NOTE.—The authors are associate agronomist, Division of Nurseries, Soil Conservation Service, cooperating with the agronomy section, Iowa Agricultural Experiment Station, Ames, Iowa, and assistant conservationist, Soldier-Maple Valley Soil Conservation District, Soldier, Iowa, respectively.

Workers found it somewhat difficult to use a combine satisfactorily for harvesting field stands because the seeds are long-awned. Good results have been obtained by cutting the crop with a binder, shocking, and threshing with a stationary combine after the bundles are thoroughly dry. The bundles are headed with a combine sickle, which greatly reduces the amount of straw running through the machine. Following threshing operations with a combine, the seed is run through a hammer mill at a reduced speed of 800 to 900. A $\frac{3}{16}$-inch screen is used for the removal of the long awns. The seed is then fanned and is ready for sowing.

Canada wild-rye is widely distributed in the upper Mississippi Valley, and has been observed in fence rows in practically every county in Iowa. A large number of individual plants was collected from field stands and planted in the nursery for comparative purposes. Strain variations in green-weight yields showed a range of from ½ to 4 pounds per plant and variation in height of 21 to 36 inches, while differences of 24 days existed between the earliest and latest dates of heading. Superior strains are being developed. Such qualities as disease resistance, quality of leaves and stems, forage yield, and lodging resistance are given particular attention in the improvement work, a cooperative project of the Soil Conservation Service and the Iowa Agricultural Experiment Station.

Canada wild-rye cut with binder and shocked to dry thoroughly prior to heading and threshing with stationary combine.

Among the cooperators with soil conservation districts in western Iowa who are field testing the sweetclover-Canada wild-rye combinations are Hervert Holverson, Soldier; A. S. Wendel, Bronson; Frank Head, Shenandoah; Ralph Liston, Glenwood; John Behrendt, Harlan; and V. Stuart Perry, Carroll.

Canada wild-rye stands a good chance of filling a definite gap in the vegetative program in the western two tiers of Iowa counties as well as in other parts of the Mississippi and Missouri Valleys.

GRASS SEED—FROM START TO FINISH

By M. M. HOOVER

Who among you, upon casual inspection of a sample of grass seed, observes not only the physical properties of the seed but also sees the story of adventure, research, and labor that becomes a part of that seed from its origin to the finished product? The story of grass seed, particularly in recent years, is the story of conservation thinking and effort, of progress and study, of trial and error, of the use of vegetation as a conservation tool. It is the story of plant improvement and selection, of Bureau, State, and Service cooperation and, finally of success in bringing plants into new conservation use and into an integrated program harmonious to soil capabilities and correct land use. We are fortunate during this critical period in having a firm foundation of information and experience on which to establish seed programs that will effectively contribute to the national needs.

The story often packs drama. We may begin thousands of miles away with a single plant, the discovery of a plant explorer who must carefully husband his find until he returns to his homeland. Or, the rambling scientist may observe plants in agricultural use in other lands, already selected and improved by local plant breeders, that may be used advantageously in the United States.

The saga may begin with the choice of a native plant from among many thousands of similar plants—a plant of some superior characteristic which sets it slightly apart from its neighbors. Again, the chronicle may start in the laboratory of the plant breeder who applies his art of hybridization to the creation of a new progeny that combines in accurately predictable manner the desirable characteristics of chosen parents.

This progeny, as well as accessions from foreign lands or selections obtained from native stands, are assembled and subjected to a carefully organized series of observational tests to determine comparative values. Drama exists throughout each step of the evaluation process, for who will deny the plant breeder or the plant explorer the right to enjoy paternal interest in his contribution or discourage his sincere belief that in his particular selection or creation will be found all the virtues and few of the vices attributed to the plant kingdom? Is there not something of drama in each step of the domestication of a wild grass just as there is drama in the breaking of a wild horse? Interest in such domestication

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EDITOR'S NOTE.—The author is assistant chief, Nursery Division, Soil Conservation Service, Washington, D. C.

is greatly intensified when the fact is appreciated that the native plant has survived and evolved in harmony with changes in environment since the beginning of time and now, under critical study and manipulation through a few short plant generations, submits to man's will and enters the fold in his service—as have so many economically valuable plants.

Nature has been generous in creating and maintaining infinite variations in plants and in adapting these ecotypes to widely differing environmental conditions. Man, in turn, has proved adept in recognizing these variable forms and appropriating them for his own use. The many species, varieties, and strains of plants now cultured by man are sufficient proof of this relationship.

Recent programs of soil and water conservation have introduced new and unusual uses for plant materials. Technicians engaged in conservation work are credited with recognizing vegetation as a conservation tool. Efforts have been made to maintain and increase plant density in pasture and range areas, to provide protection of arable acres by cover crops, temporary meadows, or strip crops, as well as increase in percentage the cultivated acres devoted to close-growing and sod crops. Nor have the undergrown portions of grass plants been overlooked, for plant roots serve to bind soil particles and thus protect against soil losses from wind and water erosion. Increased organic matter content and improved soil texture are closely associated with a cropping procedure in which grasses occur regularly in the rotations.

Conservation technicians are not content to make use of "just any" plant material. It is to their credit that efforts have been made to use the *best possible* plant materials for a given purpose. The technique required for the comparative study of a large number of plant accessions in terms of forage yield, palatability, conservation use, seeding habits, and other utility uses has given rise to the observational method of plant improvement now followed at 30 plant nursery centers maintained by the Soil Conservation Service. The major advantage of the method concerns the rapidity, economy, and thoroughness with which superior plants of a given species may be isolated from a large volume of plant material containing an infinite number of variable forms.

Initial observation, field trial, and seed increase represent the three major phases of this work. Accessions are grown in standard nursery rows where agronomic and utility notes may be recorded and compared readily. A selection is retained or discarded on the basis of its performance in comparison with other selections growing under similar conditions.

Field plantings located at chosen sites throughout the probable area of use and adaptation serve as crucial tests for those accessions that show promise in the initial nursery planting. These field plantings are usually one or more acres in size, and so designed that practical field equipment and field conditions will permit a careful comparative study. Practical evaluations of stand establishment, erosion control value, forage yield, palatability, plant association compatibility, and seed production are made of the selections being grown in the field trials; thus, the validity of basic information obtained in the initial comparative tests is expanded to practical analysis under field conditions.

Seed increase is the third and final phase of the observational program, and wide distribution of seed will depend upon the adequacy of facilities provided for this activity. The Soil Conservation Service, through use of production facilities at plant material centers, can produce sufficient seed for completion of adaptation studies, field tests, and such detailed research projects as the experiment station and cooperating research bureaus may wish to make. However, facilities at plant materials centers are not adequate to maintain a source of foundation stock, and also provide sufficient seed for general distribution and use.

Effective seed increase has been accomplished by two methods, (*a*) seed increase plots on farms of soil conservation district cooperators and (*b*) seed increase by members of state crop improvement associations.

In the former, the district supervisors are supplied with foundation seed of a new strain or variety which, in the judgment of technicians representing the interested cooperating bureaus, has demonstrated its superior conservation value throughout the observational program and should be increased for general distribution. The district supervisors assume responsibility for the seed and may use or distribute it by either of two methods, as follows:

(*a*) Plant it on land which they, as supervisors, control for the district, in which case the seed increase may be distributed to district cooperators at cost of production. Since the district cooperators own the seed, they are permitted to use further seed increase as they may wish.

(*b*) Allot the seed to district cooperator seed growers for a share of the seed increased from the foundation seed lot for the productive life of the original planting, but in no case more than 5 years. Under this arrangement the district seed grower usually retains 20 percent of the seed produced annually for his own use and offers the remaining seed to the district supervisors for purchase by other district cooperators at a price mutually agreeable to both seed producer and district supervisors.

Most states have seed certifying agencies that register and inspect the seed of a member-grower who conform to specified standards and requirements. Through this procedure a seed purchaser is assured of obtaining a product of high grade and quality, as well as a guarantee of pedigree.

If soil conservation district seed growers follow the procedures and standards prescribed, they are eligible to become producers of certified seed. This is very desirable, since it provides a means of rapidly increasing the seed of varieties and strains that have been recommended by the agencies working cooperatively in the program of grass improvement.

The State experiment station is responsible for recommending a given strain or variety of grass for use in the State; however, the research information on which this

recommendation is based may be obtained through cooperative studies. During all phases of observation, field tests, and seed increase production, the new plant selections are under constant surveillance by trained technicians of the Soil Conservation Service, the State experiment stations, and other cooperating agencies interested in the improvement of plant materials. The evaluation of a given accession therefore represents the composite judgment of numerous technicians who pool their information and experience to make a fair and impartial analysis of performance. Recommendations for certification by an experiment station are based on performances in cooperative studies.

Much can be said in favor of this pooling of judgment to arrive at a critical appraisal. It not only reflects a united opinion but also involves the dual or multiple use of available facilities of the cooperating agencies. For example, the assembling of plant accessions at nursery plant materials centers for initial observation offers the plant breeder from the State experiment station or the Bureau of Plant Industry plant materials which he could not assemble and use effectively if the work of plant breeding were undertaken as an independent bureau activity. Seed increase and seed certification provide an opportunity for the cooperative approach to become far more effective than would be possible if the work were not sponsored and actively carried forward by all interested agencies.

In telling the story of seed improvement from start to finish, it seems we have fallen short of our objective to present forcefully the drama of accomplishment through cooperative approach. There has been no time in our history of greater opportunity for teamwork, and the progress made in the improvement and use of forage crops in our general agriculture during the past decade is evidence of what can be done by working together. Ten years ago one found relatively few active projects dealing with forage-crop improvement and forage-crop utilization on State and Federal research stations, whereas today projects of this type are receiving major attention.

Although field programs looking toward greater use of forage species by action agencies of the Department of Agriculture have been beneficial in arousing interest in this work, by far the most important factor has been the incessant demand by individual farmers to make changes in their farm operations that will assure maximum safe and continuous production on each acre. The concept of land capability and correct use of each acre demands the more general use of forage species and provides as well for the adoption of carefully planned rotations. This concept, in turn, is contingent on cooperative effort of all the technical agencies concerned.

The general shortage of forage crop seeds is so critical in some areas as to threaten our entire production effort, and has led to the development of two programs to provide needed credit and stimulation.

The price-support program establishes a loan value to the seed grower by the Commodity Credit Corporation for forage crop seed meeting certain specifications as to purity and germination. This loan may become operative and is optional to the seed producer if the market value falls below a predetermined level. The established loan value for seed that meets the required germination and purity standards thus serves as a guarantee to the producer. This program also provides a premium for seed of certified varieties and strains designated by State experiment stations that is grown in accordance with the standards of State seed-certifying agencies. The differential is sufficient to offset the additional cost of production to the grower.

A second program, also assisted by Commodity Credit Corporation funds, relates to the production of foundation seed of improved strains and varieties. Foundation seed is the direct result of hybridization and selection by plant breeders and experiment stations. Normally, the initial quantity of such seed is very limited, and facilities are not always available at experiment stations for safeguarding the genetic purity of foundation seed stocks until sufficient volume has been obtained to permit general distribution and use.

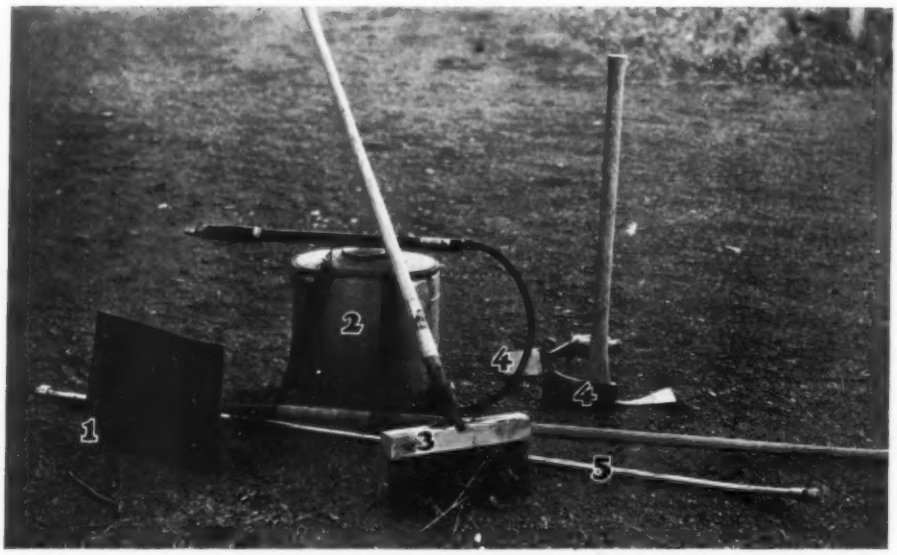
The proposed program for the increase of foundation seed stocks suggests the use of Commodity Credit Corporation funds for the purchase of available foundation seed stocks at a price designated by the experiment station or State seed certifying agency. This price is designed to cover the extra expense and care required in handling this special class of seed. The foundation seed obtained in this manner will be allocated to carefully selected seed growers chosen by the State experiment station, State seed certifying agency, and Commodity Credit Corporation representatives, the growers agreeing to follow the standards and regulations prescribed for the production of certified seed.

The State experiment station, State seed certifying agency, and Commodity Credit Corporation establish the price at which foundation seed is made available to the seed grower, as well as set a guaranteed price to the grower for all seed produced from the foundation seed stock that meets certification standards. The State experiment station or State seed certifying agency thus acts as agent for the Commodity Credit Corporation, and collaborates in establishing suitable prices for the different classes of certified seed as well as in the allocation of the seed to growers within their State.

This is the story of seed improvement from start to finish. It touches on the observational method of plant improvement, the advantages of cooperation among States, bureaus, and individual workers, the role of Soil Conservation districts through their farmer cooperator seed growers as well as State certified seed growers. It indicates some of the new and special uses for grasses. It tells of departmental programs designed to stimulate and increase the production of imported varieties.

Thus, have I attempted to relate the headway being made with these important forage plants in the hope that still greater progress may be the reward in the future.

TRAINING PRAIRIE FIRE FIGHTERS IN NORTHEASTERN COLORADO



FIRE-FIGHTING EQUIPMENT

1. Swatter made from rubberized belting 12 by 18 inches, attached to handle. Specially adapted to short grass fires, it may also be used on tall grass fires but only to limited extent in brush.
2. Back-pack pump, capacity 5 gallons, secured by 2-inch strap harness. Water is forced either in single stream or spray.
3. Steel brush broom, handled like a push broom. Successful in controlling fires in short perennial grass. Not satisfactory in annual grasses, such as dry cheat grass.
4. Pulaski tool and guard, used to limited extent in construction of fire line through short grass on hard land. Loosens sod for removal by shovel.
5. Fog nozzle on power pump. Produces fine spray. Will extinguish short grass fire as fast as truck can conveniently move along fire line.

By F. R. STANSBURY and MORGAN L. MINKER

It was a fall day on the Earl Johnson ranch out in Weld County, Colo. Grass on the range swayed and rippled in a brisk breeze. Twenty-five ranchers and farmers, the county sheriff, several men of the Department of Agriculture, and a crew of civilian public-service assignees were gathered near the Johnson headquarters to take part in a prairie fire-control demonstration.

"I sure wouldn't want a grass fire to start on *my* place with the wind blowing like this," someone remarked. Another added, "If it got out of hand, it'd be just too bad."

Soon after this comment, a fire was set deliberately, and the hungry flames raced through the luxurious grass only to be checked within a designated area by experienced fire fighters. Despite the strong wind, a fire line was burned around the Johnson headquarters.

The demonstration was a success, for it proved to the ranchers' satisfaction that grass fires can be controlled through organization of fire-fighting crews and the use of proper equipment. Since the demonstration came as the climax of a program of education in prairie fire fighting, it would be well to retrace the events that preceded it.

During the fall and winter of 1942–43, approximately 10,000 acres of native grasses were burned on the Northeastern Colorado Land Utilization and Conservation Project in Weld County. The flames ate up sufficient winter feed for 500 head of livestock and laid the ground bare to wind and water erosion.

The prairie fire was costly, but it did accomplish one thing: it awakened ranchers to the necessity of doing something to combat other fires that might sweep the prairies and destroy forage greatly needed for wartime livestock production.

The Pawnee Cooperative Grazing Association,

EDITOR'S NOTE.—The authors are, respectively, district conservationist, Fort Collins, Colo., and project manager, Weld County Land Utilization Project, Soil Conservation Service.

which is cooperating with the Soil Conservation Service in the use of range lands on Site II of the land utilization project, took the lead. They came to the Service with the request that a workable fire control plan be developed.

This was a challenge readily accepted, and soon the Service technicians were conferring with Forest Service officials, the Colorado State Extension forester, the Fort Collins fire department, and local ranchers. Naturally many and varied suggestions were received. Out of them was developed a plan which was submitted to the Pawnee Association for its approval.

The plan contemplated that the local people should be responsible for its execution. Basically, it resolved itself into two phases: first, proper organization of available manpower; second, proper use of available equipment.

Since the land utilization project had already been divided into definite blocks for administrative purposes, it was proposed that the Pawnee Association select block wardens and assistant block wardens from members living within these geographical divisions. Next, a training course was outlined and fire fighting equipment was listed for purchase or assembly.

Then the educational program got under way. It was decided that the technique of fire fighting could best be taught through demonstration. The Service began the training of conscientious objector assignees located at the Buckingham Side Camp in the project area. T. P. Treadwell, chief of the Fort Collins fire department, talked to the men on fire hazards and ways of controlling fires. C. K. Collins, assistant supervisor of the Roosevelt National Forest, assisted the Soil Conservation Service in teaching the technique of back-firing. After the assignee crew had received adequate training, arrangements were made to hold a demonstration on the Earl Johnson ranch under actual field conditions.

The day of the demonstration—September 16—was windy, and some of the ranchers feared the fire might get out of control. We knew, however, that our fire fighters were well trained, and we decided to go ahead with the demonstration as scheduled.

First, the project manager called the group together at Mr. Johnson's barn, pointed out the blocks on a project map, and named the wardens and their assistants in each block. Then he discussed the need for organization and cooperation in fire fighting, emphasizing the responsibilities of the block warden and the county sheriff in combatting fires that might start outside the project.

After all details of the fire control plan and methods of prairie fire fighting had been discussed, the group went to the field. The first part of the field demonstration was an explanation of names and uses of equipment, including back pack pumps, flappers, torches, shovels, pulaskies, brooms, and a 250-gallon tank equipped with a hand-operated threshing machine pump and a garden hose with nozzle.

Then came the real test—the test by fire. The grass was set ablaze and the project manager, acting as fire warden, gave orders to the crew of fire fighters. Working as a well-trained team, the crew kept the fire under perfect control at all times.

After this, other fire-fighting methods were demonstrated. These methods included (1) the construction of fire lines by lister and plows, using one and two furrows, (2) the use of a wet strip of grass to back-fire against when a mineral earth fire line is not feasible and natural barriers are not available, (3) the proper organization of a back-fire crew, (4) the burning of back-fires, and (5) methods of distributing men on a fire line.

After each demonstration, Mr. Johnson, the fire warden responsible for the block, was asked to take a group of farmers and ranchers through the same method to give them actual experience and confidence in methods of fire fighting. The men had watched each demonstration with such interest that they were able to apply their newly learned techniques quite successfully.

Within a short time, news of the demonstration had spread, and other farmers and ranchers urged us to give repeat performances. The second meeting, held for the Keota fire block, was attended by approximately 120 persons, including students from the Buckingham and Keota schools.

The county commissioners and the county extension agent have given valuable assistance in the fire control program. The commissioners have asked county road maintenance crews to bring a road maintainer and take part in the demonstrations, and the county agent has helped by telling farmers and ranchers living off the project when each meeting would be held.

In order to have sufficient fire fighting equipment on hand, members of the Pawnee Association have bought 25 back pack pumps, made flappers, and rigged up a water tank similar to the one we used in the demonstrations. Furthermore, members of the Association's fire control committee have made inspection trips to each rancher's headquarters to determine types of equipment available for fire fighting and to make suggestions for elimination of fire hazards.

The demonstrations will be continued until one has been held in each fire block.

SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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SHORT LOOK BEHIND—LONG LOOK AHEAD

Soil conservation is opening new frontiers, dramatic new rural opportunities. There is more than a hint, in the 1943 Annual Report of the Chief of the Soil Conservation Service, that much of the original, primeval America—the America of fertile soils, verdant hills and valleys, lush plains, and clear waters—can be brought all the way back; brought back, and included in the rich heritage of oncoming generations.

The intelligence and energy and imaginative genius of the New World agriculture are fighting today not merely for survival against dust bowl and flood but for wider and finer horizons. The partnership of the land and of the people is becoming vital and personal: they are merging their resources, pooling their powers. The same partnership which is performing astonishing feats in war is laying the basis for even mightier accomplishments in peace. It is preparing the way for a faithful and intelligent stewardship which will invoke on nearly every acre the best that can be drawn from science and experience and an awakened conscience.

Paragraphed here are a few pungent quotations from the latest summary of progress of the fast-maturing Soil Conservation Service. The summary is of added interest because it puts a period to the first eventful chapter of the book—marks the completion of the first 10 years of the formal soil conservation program—THE EDITOR.

The Nation's soil conservation program, born a decade ago and dedicated to the greater security and continued prosperity of man, is demonstrating its capacity for service in war time.

The methods of land use, soil protection, and water conservation, designed in time of peace to maintain and build the great resource of soil on which this Nation's agriculture is founded, have demonstrated a new and wider usefulness.

The year just past has marked the greatest forward strides in the history of soil conservation, not in spite of the war, but because the war demands the best from our agriculture, and soil-conservation farming is part and parcel of agriculture in this country at its best, today and tomorrow.

Intelligent, efficient use of land, rather than wanton exploitation, is the growing trend of the times.

No sacrifice is more pitiful and costly than needless sacrifice of productive land—man's most essential natural resource, along with water.

There is no other experience anywhere that is comparable to this continuing soil and water conservation movement, and the implications for its future are worthy of the most careful consideration.

Not more than 10 percent of the land in need of protection has been adequately treated to date. Ninety percent of the job is as yet undone.

The Service has cooperated with military establishments in various ways: In the acquisition of land; protection of military sites—more than 300 in all—against erosion, flooding, and poor drainage; in the production of maps for use in military operations; and in the development of camouflage techniques.

Currently, the Soil Conservation Service is devoting all its resources wholly to the furtherance of the Nation's war effort.

The war program of the Service accomplishes two things simultaneously: It makes its maximum contribution to wartime food production requirements and it paves the way to more rapid completion of the long-time soil conservation job of the Nation when the war is over. In short, the war program of the Service is geared to accomplish now those things which will at once contribute to the winning of the war and also serve the country's long-range objectives.

In soil and water conservation there is no substitute for knowledge and technical excellence.

The Soil Conservation Service is essentially a corps of trained, experienced land specialists organized to help—to serve—the farmer out on the ground, to provide security to the land and those who use the land, to build and sustain soil productivity, to strengthen the community and the Nation.

If there were some simple remedy for the ills of the land that could be applied indiscriminately, as a standardized treatment, the job of soil conservation would be relatively easy. But there is as much variety in erosion as in the landscape.

When it is applied to all cropland needing treatment, conservation may be expected to give us returns amounting to the production equivalent of a million new farms—and this without the addition of any more land.

Whereas much time during the last 10 years was necessarily devoted to research and development of the scientific techniques of conservation, it will be possible in the years ahead for personnel of the Soil Conservation Service to spend even more time on the necessary educational work and on the technical assistance which are requisites to application of conservation measures. We now know the fundamentals.

Soil conservation is the youngest of the agricultural sciences.

In the conduct of a Nation-wide program of soil and water conservation, depending for success wholly upon the full understanding and cooperation of the public, the Soil Conservation Service has recognized that continuing research work is essential to develop useful knowledge and continuing information work is essential to disseminate useful knowledge, before technical operations can be undertaken on the lands of private individuals with any assurance of success or permanence.

In a democracy, where no dictator can require conservation of soil and water, the effectiveness of a full, free flow of information in awakening public consciousness to a great national problem has been wholesome and convincing.

The principal gage of the efficacy of the training work lies in the fact that soil conservation has continued to make progress despite the war and reduced personnel.

For almost a year, the Service has been engaged in a survey and analysis of the soil and water conservation needs of the Nation. This undertaking, which is now nearing completion, will provide a factual, physical analysis of the land resources of the country, indicating what conservation measures need to be applied, and to what extent, if we are to achieve maximum efficiency and full productive use of our soil wealth.

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Compiled by ETTA G. ROGERS, Publications Unit

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